REMARKS

By this amendment, claims 1-12, 17-20, 26-32, 34-38 and 89-130 are pending in the application. Of these, claims 1, 12, 19, 26-32, 34-38 and 129 are being amended. Claims 21-25 and 39-88 remain withdrawn. The amendments are fully supported by the originally filed specification and original claims and add no new matter. For example, the amendments to claims 1 and 19 to recite a ceiling "facing a substrate" is supported at least by Figures 1 and 7 which show a ceiling (55) that is positioned facing a substrate (30.) The specification is being amended to ensure correspondence with the claims, and the amendment is similarly supported by Figures 1 and 7. Entry of the amendments and reconsideration of the present case is respectfully requested.

<u>Allowed and Objected to Claims</u>

Applicants appreciate the Examiner's indication of the allowability of claims 89-128. Applicants also appreciate the Examiner's indication that claims 10,11, 17, 18, 37 and 38 would be allowable if re-written in independent form and including the limitations of their base claims.

<u>Rejection Under 35 U.S.C. 102(e) of Claims 1-4, 8, 9, 12, 19, 20, 26-28, 32, 35 and 36</u>

The Examiner rejected claims 1-4, 8, 9, 12, 19, 20, 26-28, 32, 35 and 36 under 35 U.S.C. 102(e) over U.S. Patent No. 5,759,424 to Imatake et al. This rejection is respectfully traversed.

Claim 1 is not anticipated by Imatake et al. because Imatake et al. does not teach "a ceiling adapted to face the substrate, the ceiling comprising a radiation transmitting portion ...[and] a mask overlying the radiation transmitting portion and extending into a process zone of the process chamber," as recited in the claim. Instead, Imatake et al. discloses a sampling window that is placed in a sidewall of the processing chamber, as shown in Figure 1. (Column 13, lines 66-67.) Thus, Imatake et al.

discloses a chamber sidewall having a sampling window, but does not teach the recited ceiling with the radiation transmitting portion and mask overlying the radiation transmitting portion. Furthermore, Imatake et al. does not teach the recited mask that extends into a process zone of a process chamber. Instead, Imatake et al. discloses that "a plurality of shields and a glass plate 15 are mounted by a hermetic sealing O-ring 16 to an elongated hole 17" (column 14, lines 9-10.) Figure 1 shows that the elongated hole having the shields is recessed back away from the chamber wall that surrounds the zone in which the substrate is processed. Thus, the elongated hole and shields are removed from the process zone of the chamber, and the shields do not extend into the process zone. Accordingly, claim 1 and the claims depending therefrom are not anticipated by Imatake et al.

Claim 19 similarly recites "ceiling adapted to face the substrate, the ceiling comprising a radiation transmitting portion having a mask extending into the a process zone of the chamber," and thus claim 19 and the claims depending therefrom are not anticipated by Imatake et al. because Imatake et al. does not teach a ceiling having a radiation transmitting portion and does not teach a mask extending into a process zone of a chamber.

Claim 26 recites "a ceiling capable of being mounted on a process chamber facing a substrate, the ceiling comprising: a radiation transmitting portion; and an overlying mask adapted to extend into a process zone of the chamber," and thus claim 26 and the claims depending therefrom are also not anticipated by Imatake et al. because Imatake et al. does not teach a ceiling having a radiation transmitting portion, and does not teach a mask extending into a process zone of a chamber.

Claim 12 is not anticipated by Imatake et al. because Imatake et al. does not teach a "mask having an aperture comprising an aspect ratio that is selected to reduce deposition of process residue on the radiation transmitting portion, the aspect ratio being from about 0.25:1 to about 3:1," as recited in the claim. Instead, Imatake et al. discloses that "when the axial length of the hole 17 is selected to be no smaller than

five times of a diameter, the electrons are easy to be lost by the inner wall of the hole 17 so that the plasma cannot enter the hole" (column 14, lines 21-24.) Thus, Imatake et al discloses a hole having a ratio of length to width of no smaller than 5 to 1, but does not teach the recited aperture having an aspect ratio of from about 0.25:1 to about 3:1. Accordingly, claim 12 and the claims depending therefrom are not anticipated by Imatake et al.

Furthermore, claim 12 is not obvious over Imatake et al. because the recited aspect ratio is not obvious over the larger aspect ratio of Imatake et al. Imatake et al. discloses that the ratio of length to width is selected such that "plasma cannot enter the hole" (column 14, line 24.) In contrast, the claimed ratio is "is sufficiently small to allow ions of the energetic process gas to enter the aperture and etch away the process residues formed on a sidewall of the aperture 145 and/or on the surface of the transparent plate" (paragraph bridging pages 16 through 17.) Thus, the claimed ratio reduces deposition according to a different mechanism than the ratio of Imatake et al., namely by allowing etching gas through the aperture, rather than blocking gas from entering as in Imatake et al.

The different mechanism is further illustrated by Figure 5 of the present application, which is a graph of the net deposition on a window for decreasing aspect ratio. This graph shows that for aspect ratios greater than 5:1 the net deposition continues to decrease, while for aspect ratios a little less than 5:1, the net deposition increases. This result is consistent with Imatake et al. which discloses selecting a ratio of no less than 5:1 to reduce deposition. However, Imatake et al. does not teach or suggest the unexpectedly good results achieved by aspect ratios less than or equal to about 3:1 and greater than or equal to about 0.25:1, as is also shown on the graph. For these smaller aspect ratios, the net deposition also decreases, and it is believed that this decrease in the net deposition is due to the etching away of deposited species by etching gas that is allowed through the apertures. This result is furthermore unexpected because one of ordinary skill would expect that allowing etching gas species through the apertures would result in an increase in the deposition of species from the etching

gas, which is the case for very small aspect ratios, such as an aspect ratio of less than 0.1 as shown on the graph. Thus, the claimed aspect ratio is not taught or suggested by the larger aspect ratio of Imatake et al., and the aspect ratio furthermore provides unexpectedly good results in the reduction of deposition on a radiation transmitting portion. Accordingly, claim 12 and the claims depending therefrom are not anticipated by Imatake et al.

Rejection Under 35 U.S.C 103 of Claims 1-9, 12, 19, 20, 26-32, 34-36, 129 and 130

The Examiner rejected claim 1-9, 12, 19, 20, 26-32, 34-36, 129 and 130 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,290,383 to Koshimizu in view of JP 126991 to Oshida et al. This rejection is respectfully traversed.

Claim 1 is patentable over Koshimizu in view of Oshida et al. because neither of the references teaches or suggests "a ceiling adapted to face the substrate, the ceiling comprising a radiation transmitting portion ... [and] a mask overlying the radiation transmitting portion and extending into a process zone of the process chamber, the mask having an aperture comprising an aspect ratio that is selected to reduce deposition of process residue on the radiation transmitting portion," as recited in the claims. Instead, Koshimizu discloses that "a window 124 made of, for example, quartz, is formed in the side wall of the chamber," (column 13, lines 53-54.) Thus, Koshimizu discloses a sidewall having a window, but does not teach or suggest a ceiling having a radiation transmitting portion, as recited in the claims. Koshimizu also does not teach or suggest a mask overlaying a radiation transmitting portion. It would furthermore not be obvious to provide a ceiling having a radiation transmitting portion in the chamber of Koshimizu because Koshimizu discloses an electrode (108) for gas energizing purposes, as shown in Figure 8, that is positioned between the ceiling and substrate and would thus block the transmission of radiation from the substrate to the ceiling.

Oshida et al. also does not teach or suggest a ceiling having a radiation

transmitting portion and mask. Oshida et al. discloses that "for detection optical system (1), objective lens (11) and perforated opaque filter (13) are accommodated in a basket, which is connected to optical fiber (12)," (paragraph 20), and which are placed inside a chamber, as is shown in Figure 1. [Emphasis added.] Thus, Oshida et al. discloses an optical detection system that is located inside the chamber, but does not teach or suggest a ceiling having a radiation transmitting portion such that a process monitor can be located outside the chamber to monitor a process in the chamber. Accordingly, as both Koshimizu and Oshida et al. do not teach or suggest the ceiling having the radiation transmitting portion of claim 1, claim 1 and the claims depending therefrom are patentable over Koshimizu and Oshida et al.

Furthermore, it would not be obvious from Oshida et al. to provide a ceiling having a radiation transmitting portion and overlying mask. Oshida et al discloses that "in the case of film processing with an ion milling apparatus, the light emitted by the neutralizer in the ion milling apparatus is a major background noise, so that it becomes almost impossible to detect the light emitted from the film under processing" (paragraph 4.) To solve this problem, a detection optical system is used that has "a high detection directionality towards the surface of the object for detection or vicinity of said surface" (paragraph 5) and in which "detection optical system (1) and illuminating optical system (2) are set inside chamber (4)" (paragraph 27). Also, "corresponding to elevation of said adjusted elevating mechanism (33), detection optical system (1) and illuminating optical system (2) that are fixed on said elevating mechanism (33) are interlocked with each other" (paragraph 28.) Thus, Oshida et al. discloses that the placement of the detection system in the chamber is important. Consequently, one of ordinary skill in the art upon reading Oshida et al. would not be inclined to change the detection position from the sidewall to the ceiling. Placing the radiation transmitting portion in the ceiling is advantageous, for example, in interferometry, it allows an incident light beam to be directed at nearly a right angle to the substrate to monitor etching of features having high aspect ratios, which would otherwise block a low angle beam. These advantages are not taught or recognized by Oshida et al.

Similarly, claim 19 is also patentable over Koshimizu in view of Oshida et al. because neither of the references teaches or suggests "a ceiling adapted to face the substrate, the ceiling comprising a radiation transmitting portion having a mask extending into a process zone of the chamber, the mask having a plurality of apertures, the apertures having an aspect ratio that is selected to reduce deposition of process residues on the radiation transmitting portion," as recited in the claim. Instead, as discussed above, neither of the references teaches or suggests the desirability of a ceiling having a radiation transmitting portion and mask. Accordingly, claim 19 and the claims depending therefrom are patentable over Koshimizu and Oshida et al.

Claim 26 similarly recites "a ceiling capable of being mounted on a process chamber facing a substrate, the ceiling comprising: a radiation transmitting portion; and an overlying mask," and thus this claim and the claims depending therefrom are also patentable over Koshimizu in view of Oshida et al.

Claim 12 is patentable over Koshimizu in view of Oshida et al. because neither Koshimizu or Oshida et al. teach or suggest "a mask overlying the radiation transmitting portion and extending into the interior of the chamber, the mask having an aperture comprising an aspect ratio that is selected to reduce deposition of process residue on the radiation transmitting portion, the aspect ratio being from about 0.25:1 to about 3:1," as recited in the claim. A discussed above, Koshimizu does not teach or suggest a mask overlying a radiation transmitting portion. Oshida et al. discloses "an opaque perforated filter having plural holes with an aspect ratio corresponding to the directionality of the detection system set in front of the objective lens or aperture window where said contamination of the optical system would take place. In this way, the *etching gas* or the fine particles formed in milling that were formerly the source of contamination can hardly reach said objective lens or window, since most of the particles collide with the hole [walls and are stopped]" (paragraph 16, emphasis added.) Thus, Oshida et al. discloses an opaque perforated filter having an aspect ratio that reduces contamination of a lens by stopping etching gas from reaching the lens, but

does not teach or suggest the recited aspect ratio.

Furthermore, in rejecting the claim, the Examiner stated that it has been found in previous cases that "where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device." However, the claimed mask is not obvious over Oshida et al. because the claimed aspect ratio does perform differently than the opaque perforated filter holes of Oshida et al. Oshida et al. discloses that the holes operate by stopping etching gas from reaching the lens. In contrast, as discussed above, the claimed aspect ratio is a ratio that "is sufficiently small to allow ions of the energetic process gas to enter the aperture and etch away the process residues formed on a sidewall of the aperture 145 and/or on the surface of the transparent plate" (paragraph bridging pages 16 through 17), as is also shown in Figure 5 of the present application. Accordingly, aspect ratios that "block" species from reaching a window function differently from lower aspect ratios that allow etching species through an aperture to etch away deposited material, and thus the recited aspect ratio is not equivalent to, and is also not obvious over the gas species blocking aspect ratio of Oshida et al.

Claim 129 similarly recites "a mask overlying the radiation transmitting portion and extending into a process zone of the chamber, the mask having an aperture comprising an aspect ratio that is sufficiently small to allow ions of the energized gas to enter the aperture and etch away the process residues formed on a sidewall of the aperture and the radiation transmitting portion to reduce deposition of process residue on the radiation transmitting portion, the aspect ratio being from about 0.25:1 to about 3:1," and thus this claim and the claims depending therefrom are patentable over Koshimizu in view of Oshida et al. because neither of the references teaches or suggests the claimed aspect ratio.

The Examiner rejected claims 6, 7, 31 and 34 under 35 U.S.C. 103(a) as

b ing unpatentable over Imatake et al. This rejection is respectfully traversed.

Claim 1, from which claims 6 and 7 depend, is patentable over Imatake et al., because Imatake et al. does not teach or suggest "a ceiling adapted to face the substrate, the ceiling comprising a radiation transmitting portion ... [and] a mask overlying the radiation transmitting portion and extending into a process zone of the process chamber," as recited in the claim. Instead, as discussed above, Imatake et al. discloses a sampling window placed in the sidewall of a processing chamber, as shown in Figure 1, and thud does not teach or suggest the claimed ceiling having a radiation transmitting portion. The claimed ceiling having the radiation transmitting portion and mask is furthermore not obvious over Imatake et al. because Imatake et al. discloses that "parallel plates 22 are provided in the processing chamber" (column 13, lines 54-55), of which at least one of the plates is placed between the substrate and the ceiling, as shown in Figure 1. Thus, one of ordinary skill in the art would not find it obvious to place a ceiling having a radiation transmitting portion in the chamber of Imatake et al, as the parallel plate would block the transmission of radiation to the radiation transmitting portion. Accordingly, claim 1 and the claims depending therefrom are patentable over Imatake et al.

Imatake et al. furthermore does not teach or suggest the claimed mask that extends into a process zone and instead, as discussed above, discloses recessed shielding means that are removed away from the process zone. Furthermore, a mask extending into a process zone of the process chamber is not obvious over the recessed shielding means of Imatake et al, because Imatake et al. does not teach or suggest the benefits of providing a mask that extends into the process zone of the chamber, such as the reduced footprint or amount of space that the chamber having the claimed mask takes up over a chamber having only a recessed portion. The mask extending into the process zone of the chamber also allows for the monitoring of a larger sampling area that is not limited to the area exposed to a recess. With a recessed mask that does not extend into the process zone of the chamber, on the other hand, the radiation transmitting portion is necessarily recessed behind the chamb r wall, and thus the

viewable area is limited to an area that is closer to the opening size of the recess, as discussed for example in the specification on page 2, second full paragraph. Thus, as Imatake et al. fails to teach or suggest the claimed mask or any of the benefits provided by the claimed mask, claim 1 and the claims depending therefrom are patentable over Imatake et al.

Claim 26, from which claims 31 and 34 depend, recites "a ceiling capable of being mounted on a process chamber facing the substrate, the ceiling comprising: a radiation transmitting portion; and an overlying mask adapted to extend into a process zone of the chamber," and thus this claim and the claims depending therefrom are patentable over Imatake et al. because Imatake et al. does not teach or suggest a ceiling having a radiation transmitting portion and overlying mask that extends into the process zone.

CONCLUSION

The above-discussed amendments are believed to place the present application in condition for allowance. Should the Examiner have any questions regarding the above remarks, the Examiner is requested to telephone Applicant's representative at the number listed below.

Respectfully submitted,

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